Hose made of thermoplastic elastomer

Specification

The invention relates to a hose, comprising a core and a cover having an embedded reinforcement support, specifically in the form of a single-layer or multi-layer reinforcement structure, whereby the core and the cover consist of a thermoplastic elastomer, in each instance.

With regard to the hose structure indicated above, there is a comprehensive prior art that furthermore describes a multiplicity of reinforcement support variants, whereby reference is made, for example, to the following references: DE 33 32 550 C2, EP 0 149 805 B1, EP 0 567 115 B1, and EP 0 848 794 B1. The reinforcement support consists of a textile and/or metallic material and is based on the purpose of use. With regard to the varied purposes of use for hoses, the following examples can be mentioned: water hoses, compressed air hoses, oil and gasoline hoses, hoses for chemicals, steam hoses, and hydraulic hoses.

Nowadays, hoses are produced from diverse materials, for example from rubber, plastics (PVC), and rubber/plastic compounds. The hose of the type stated is produced from a thermoplastic elastomer (abbreviation TPE). In particular, thermoplastic elastomers on a styrene basis (TPE-S), non-crosslinked or partially crosslinked thermoplastic elastomers on an olefin basis (TPE-O), and fully crosslinked thermoplastic elastomer on an olefin basis (TPE-V) are used. The actual production of a hose is state of the art today.

An appropriate TPE inner layer (core) is extruded. Now the reinforcement support is applied. Subsequently, the TPE outer layer is formed (mantle, cover). The problem in this production is that a combination body is produced for technically highly demanding articles, in which the individual layers must undergo bonding. As a rule, in the case of plastic hoses, the combined body is produced in that the inner and outer layer are bonded to one another by way of the thread gaps. However, there is no adhesion to the actual reinforcement support material.

At the moment when high-quality hoses are produced, however, it is necessary to build more reinforcement supports into the hoses, and therefore small thread gaps are obtained. This goes so far that the reinforcement support lies closely against itself, and there are no longer any thread gaps present. In this case, it is absolutely necessary for the core and cover material to enter into adhesion with the reinforcement support. However, this is not possible with conventional TPE materials.

With the background of the aforementioned problems, the hose according to the invention is characterized in that an adhesion-imparting intermediate layer is worked in, which can be bonded to the core and/or cover material and therefore enters into a bond with the reinforcement support. In this connection, bonding takes place within the scope of the production process.

With regard to the arrangement of the adhesion-imparting intermediate layer, the following three variants can be used, in particular:

- The adhesion-imparting intermediate layer is extruded directly onto the core, whereby the reinforcement support is then laid directly onto the intermediate layer.

- The adhesion-imparting intermediate layer is extruded directly onto the reinforcement support, whereby the cover is worked on subsequently.

- The adhesion-imparting intermediate layer is applied to the core and to the cover, so that the reinforcement support is completely bonded into the intermediate layer. This variant is particularly advantageous, particularly if there are no longer any thread gaps.

In the case of multi-layer hoses (EP 0 567 115 B1), the adhesion-imparting intermediate layer is applied between the individual reinforcement supports, whereby the variants mentioned above can additionally be used.

The adhesion-imparting intermediate layer has a minimal melting point of 75°C and a maximal melting point of 170°C.

The advantageous materials with regard to the adhesion-imparting intermediate layer are:

- An olefin plastic is used, particularly on the basis of polyethylene or polypropylene. In this connection, the reinforcement support is surrounded with twisted yarns of the

olefin plastic, or the olefin plastic is applied directly to the reinforcement support.

- The adhesion-imparting intermediate layer consists of a TPE (TPE-S, TPE-O, TPE-V) and a hydrocarbon resin, particularly an aromatic hydrocarbon resin, as well as other additives, if necessary. The hydrocarbon resin component amounts to 2 to 50 wt.-% in this connection, particularly 5 to 30 wt.-%.

- The adhesion-imparting intermediate layer is an acrylate copolymer, particularly an ethylene/acrylate copolymer. In this regard, again, the following should be particularly mentioned: ethylene methyl acrylate (EMA), ethylene ethyl acrylate (EEA), or ethylene butyl acrylate (EBA). A hydrocarbon resin, particularly again, an aromatic hydrocarbon resin, as well as other additives, if necessary, is/are mixed into the acrylate copolymer. Here again, the hydrocarbon resin component amounts to 2 to 50 wt.-%, particularly 5 to 30 wt.-%.

Here, another component in the form of a functionalized polymer is preferably added to the adhesion-imparting intermediate layer. This additional component is a malein anhydride graft polyethylene or a polypropylene grafted in similar manner, or an acrylate copolymer functionalized with polar CO groups or epoxy groups. The proportion of the functionalized polymer is 0.5 to 20 wt.-%, particularly 2 to 10 wt.-%.

- The adhesion-imparting intermediate layer is a hydrocarbon resin, particularly an aromatic hydrocarbon resin. In this connection, the hydrocarbon resin has a plastification point of 75°C to 145°C, particularly 100°C to 145°C.

The data given above in wt.-% relate to the total mass of the adhesion-imparting intermediate layer.